CLAIMS

WE CLAIM:

1. A method for correcting illumination nonuniformity across an illumination area during the synthesis of an array of oligomers from monomers, the method comprising the steps of:

measuring the illumination intensity of at least two oligomer synthesis positions at different positions in the illumination area;

evaluating mathematically the difference in illumination intensity between the at least two oligomer synthesis positions; and

adjusting the illumination intensity of the light directed to the brighter synthesis position to match that of the light directed to the less bright synthesis position.

2. The method of Claim 1, wherein the adjusting of illumination intensity of brighter positions to match that of a less bright position is accomplished by reducing the illumination time of the brighter positions during one protection group deprotection period.

3. The method of Claim 2, wherein the reducing of the illumination time is accomplished by increasing the time an illumination light is directed away from the illumination area during one protection group deprotection period.

4. The method of Claim 1, wherein the adjusting of illumination intensity of brighter positions to match that of a less bright position is accomplished by reducing the intensity of an illumination light for the brighter positions before the light reaches the illumination area.

5. The method of Claim 4, wherein the reducing the light intensity before the light reaches the illumination area is accomplished by placing a lithographic mask in front of the illumination area with different regions of the mask that correspond to different oligomer synthesis positions darkened to appropriate gray scales.

6. The method of Claim 1, further comprising the steps of:

measuring the adjusted illumination intensity of each oligomer synthesis position;

further adjusting the illumination intensities of the positions for higher uniformity.

7. An apparatus for synthesizing arrays of oligomers such as DNA probes and polypeptides, the apparatus comprising:

(i) a flow cell having one or more reaction chambers in which monomer addition reactions can be conducted;

(ii) a light source providing a light beam;

(iii) an array of optical elements placed to receive the light beam from the light source and arranged such that each element of the array can be positioned to direct light along an optical axis or to not direct light along the optical axis;

(iv) projection optics capable of receiving the light reflected from the array of optical elements along the optical axis and imaging the pattern of the optical elements onto the flow cell; and

(v) an optical element switch mechanism capable of adjusting the durations of on and off positions of each optical element during one protection group deprotection period to correct for nonuniformity in illumination intensity of the light that the projection optics project onto the flow cell.

8. An apparatus for synthesizing arrays of oligomers such as DNA probes and polypeptides, the apparatus comprising:

(i) a flow cell having one or more reaction chambers in which monomer addition reactions can be conducted;

(ii) a light source providing a light beam;

(iii) an array of optical elements placed to receive the light beam from the light source and arranged such that each element of the array can be positioned to direct light along an optical axis or to not direct light along the optical axis;

(iv) projection optics capable of receiving the light reflected from the array of optical elements along the optical axis and imaging the pattern of the optical elements onto the flow cell; and

(v) a lithographic mask placed between the projection optics and the flow cell with different areas of the mask darkened to different gray scales to correct for nonuniformity in illumination intensity of the light that the projection optics project onto the flow cell.